

this was in the daytime, when the whole process could be watched. On this occasion some of the masses of snow which were rolled up by the wind attained a diameter of three feet. They appear to have been seen, however, over an area of only some four hundred acres, whereas the snowballs yesterday were spread thickly over many square miles.

The same phenomenon was observed at Southington, Connecticut, by L. Andrews, and at Bethel, of the same state, by Nelson Taylor.

SLEET.

The dates on which sleet is reported to have fallen in the various districts are as follows:—

New England.—3d, 4th, 6th, 7th, 11th, 13th to 16th, 18th, 25th.

Middle Atlantic states.—3d, 5th, 6th, 10th, 11th, 14th, 17th, 18th, 22d, 24th.

Western Gulf.—3d to 6th, 16th, 17th, 18th.

Rio Grande valley.—3d, 4th, 5th, 17th.

Ohio valley.—1st to 12th, 17th, 18th, 24th.

Lower lakes.—2d, 3d, 14th, 15th, 23d, 24th, 25th.

Upper lakes.—2d, 3d, 14th, 16th, 17th, 24th, 27th.

Extreme northwest.—14th.

Upper Mississippi valley.—2d to 7th, 11th, 14th, 16th, 17th, 22d, 24th.

Missouri valley.—3d to 8th, 10th, 17th, 23d, 24th.

Sleet also fell in the following states and territories not included in the districts named above:—

California.—Cape Mendocino, 1st.

Louisiana.—Point Pleasant, 17th.

Mississippi.—Starkville, 17th, 18th; Vicksburg, 17th, 18th.

Montana.—Fort Benton, 20th.

New Mexico.—Santa Fé, 13th, 22d.

North Carolina.—Ore Knob, 17th.

Oregon.—Portland, 12th; Roseburg, 15th.

The following reports indicate the severity of the sleet-storm which prevailed from the 2d to 4th over eastern Missouri, Illinois, Indiana, northern Ohio, and western New York and Pennsylvania:—

Illinois.—Springfield, 2d: rain, freezing as it fell, continued during the day, and by the afternoon all exposed objects were covered with ice. On the 3d, the streets of the city were strewn with limbs of trees which had been broken off by the weight of ice. All of the telephone lines in the city were broken and in many instances the poles were weighed down. All telegraph-wires were down on the Chicago and Alton railroad northward to Bloomington and southward to Collinsville; on the Illinois Central, northeast to Gilman; on the Ohio and Mississippi, southeast to Pana; on the Wabash railroad, west to Kansas and eastward beyond the state line. Very great damage was done to the ornamental trees in Oakridge cemetery.

Lincoln, Logan county, 3d: there is scarcely a tree left standing in this city, many of which were snapped off short, while thousands are stripped of their branches. The sidewalks were rendered impassable by the fallen debris. Nearly all of the telephone-wires were prostrated, the poles in many places being broken. The few wires not broken were covered with a coating of ice two inches in diameter. Great damage has been done to fruit and ornamental trees. Several days will be required to remove the debris from the streets and to repair telegraph and telephone lines. Great destruction to forests is reported from the surrounding country.

White Hall, Green county, 4th: great damage has been done to orchards and nurseries in this vicinity. The telegraph and telephone are down and trains delayed.

Vandalia, Fayette county, 4th: the recent sleet-storm is without precedent in this section. All objects are covered with ice.

Champaign, Champaign county, 3d: the late sleet-storm has been the severest ever known. The damage to fruit and shade trees is very great, many of which are entirely ruined. All telegraph and telephone-wires in the city and nearly all of the poles were broken.

Mattoon, Coles county, 4th: all exposed objects are weighed down or broken by ice. Thousands of trees are either stripped of their branches or broken down; the telegraph-wires are

down in all directions, and trains are run with great difficulty. Many business houses have been damaged by ice and water, and business has been greatly interrupted.

Carrollton, Green county, 4th: the limbs of trees and the telegraph-wires are covered with ice one inch thick. About twenty-five of the telegraph-wires were broken in this city.

Atlanta, Logan county, 3d: all trees and shrubbery are loaded down with ice, many of them are broken and entirely destroyed. Some of the best orchards in the county have been ruined, and stock has suffered to a great extent.

Jerseyville, Jersey county, 4th: everything is heavily coated with ice, many trees have been broken and buildings damaged. The telegraph lines are down, and trains delayed.

Clinton, De Witt county, 4th: it is impossible to accurately estimate the damage to shade and ornamental trees, and orchards in this vicinity, but is considered to be not less than \$100,000. Telegraph and telephone-wires are down, but the damage in that particular is comparatively slight.

Bloomington, McLean county, 3d: the city is covered with a sheet of ice and much damage has been done to forest and ornamental trees and to the orchards. Trains on the railroads are run with great irregularity.

Indiana.—Logansport, 3d: the sleet-storm has stopped nearly all trains, and no mails arrive at, or depart from the city. The telegraph and telephone-wires are all down, and great damage has been done to fruit and shade trees. The storm is considered the most destructive that has occurred here for several years.

Kansas.—Wellington, Sumner county: ice formed on all exposed objects on the 2d, and remained until the 8th. Fears are entertained that the peach buds have been killed.

Missouri.—Saint Louis, 2d: great damage has been done by the sleet-storm, to the telegraph-wires in this city. The sidewalks are covered with ice, rendering them very dangerous to pedestrians.

Mexico, Andrian county, 4th: for thirty-six hours a very severe snow and sleet-storm has prevailed, causing great suffering to the poor classes of inhabitants and to stock. The storm is considered the severest of the kind since 1840.

New York.—Buffalo, 3d: the snow turned to rain at 1.35 a. m., which continued freezing as it fell. Ice accumulated to considerable thickness on all objects. The telegraph and telephone-wires were generally prostrated. Great damage resulted to various kinds of trees.

Ohio.—Sandusky, 3d: all exposed objects are covered with ice from one to one and one-half inches thick. None of the telegraph lines running into the city could be worked after 8 a. m. The telephone company had all of their lines broken, and many of the poles were prostrated. For a distance of ten squares every pole fell at once, causing a noise which was heard at points more than one mile distant. Over three hundred wires were broken, entailing a loss of \$5,000. Much damage was also done to trees and shrubbery.

Toledo, 2d: Sleet and rain storm, covering the ground with slush from one to ten inches deep. All travel seriously impeded; trains arrive from six to ten hours late; telegraphic communication interrupted. The rain continued during the 3d, and was followed by freezing weather on the 4th, when all objects were covered with ice, resulting in much damage to shade and ornamental trees.

Cleveland, 3d: severe sleet-storm, causing serious interruption to railroad travel. Telegraph-wires and trees are broken down in all directions.

Pennsylvania.—Erie, 3d: many of the telegraph and telephone-wires in this city were broken by the accumulation of ice.

WINDS.

The prevailing direction of the winds for the month of February, 1883, at the Signal-Service stations, are shown on chart iii., by arrows flying with the wind. In the lake region and in New England, the prevailing winds are generally from the west; on the middle Atlantic coast, from the northwest; on the North Carolina coast, from the northeast, except southwest at Wil-

mington and Fort Macon; in the Gulf states, they are mostly from the north; in the upper Mississippi and Missouri valleys, from the northwest; in the northern slope, from west and southwest; in the middle plateau, from northwest, and in California they are mostly northerly.

TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:—

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Mt. Washington, N.H.	32,404	New London, Conn.	4,841
Middle Atlantic states.....	Del. Breakwater, Del.	11,571	Lynchburg, Va.	3,131
South Atlantic states.....	Hatteras, N. C.	12,159	Jacksonville, Fla.	1,493
Florida peninsula.....	Key West.....	8,765	Cedar Keys, Fla.	5,258
East Gulf.....	Starkville, Miss.	6,805	Montgomery, Ala.	4,137
West Gulf.....	Galveston, Tex.	10,999	Little Rock, Ark.	3,982
Rio Grande valley.....	Brownsville, Tex.	8,017	Eagle Pass, Tex.	4,651
Ohio valley.....	Champaign, Ill.	7,379	Indianapolis, Ind.	3,764
Tennessee.....	Nashville.....	5,597	Knoxville, Tenn.	4,545
Lower lakes.....	Rochester, N. Y.	11,190	Toledo, Ohio.....	6,346
Upper lakes.....	Milwaukee, Wis.	9,363	Escanaba, Mich.	5,529
Extreme northwest.....	Moorhead, Minn.	7,514	Saint Vincent, Minn.	5,152
Upper Mississippi valley.....	Saint Louis, Mo.	6,937	Dubuque, Iowa.....	2,492
Missouri valley.....	Huron, Dak.	6,543	Leavenworth, Kans.	3,993
Northern slope.....	Fr. As. in. in. in. Mont.	9,647	Deadwood, Dak.	1,649
Middle slope.....	Fort Elliott, Tex.	6,618	Denver, Colo.	2,499
Southern slope.....	Fort Sill, Ind. T.	7,660	Fort Davis, Tex.	4,323
Southern plateau.....	Fort Grant, Ariz.	6,395	Silver City, N. Mex.	2,958
Middle plateau.....	Pioche, Nev.	4,835	Salt Lake City, Utah	2,590
Northern plateau.....	Eagle Rock, Idaho.	4,530	Fort Missoula, Mont.	2,065
North Pacific.....	Portland, Oreg.	3,124	Roseburg, Oreg.	1,730
Middle Pacific.....	Cape Mendocino, Cal.	12,129	Sacramento, Cal.	3,817
South Pacific.....	San Diego, Cal.	4,699	Visalia, Cal.	2,249

* No record at Pike's Peak during the month.

HIGH WINDS.

On the summit of Mount Washington, New Hampshire, there was only one day during the month on which a maximum velocity of less than 60 miles per hour was recorded, viz.: 56 nw., 22d. The wind reached or exceeded 80 miles per hour as follows: 109 nw., 1st; 94 nw., 2d; 80 w., 4th; 92 nw., 5th; 80 nw., 6th; 90 nw., 7th; 84 nw., 9th; 90 nw., 10th; 98 nw., 12th and 14th; 84 w., 16th; 101 nw., 17th; 72 nw., 19th; 80 nw., 21st; 94 sw., 25th; 100 nw., 26th; 126 nw., 27th, maximum for month. On the 17th, the daily movement was 1,825 miles, or an average hourly velocity of 76 miles for twenty-four hours. This is the greatest daily movement ever recorded at this station.

Cape Mendocino, California, 52 se., 11th; 80 se., 12th; 78 se., 13th; 56 se., 17th.

Other stations reporting high winds are as follows: Indianola, Texas, 60 n., 17th; Galveston, Texas, 59 n., 17th; Portsmouth, North Carolina, 56 ne., 12th; Barnegat City, New Jersey, 52 nw., 12th; Delaware Breakwater, Delaware, 52 sw., 4th; Fort Elliott, Texas, 52 n., 16th; Cape May, New Jersey, 48 nw., 21st and 27th; Fort Grant, Arizona, 48 se., 19th; Rochester, New York, 48 n., 25th.

LOCAL STORMS.

Sandusky, Ohio, 14th.—At 4.45 p. m. a cloud of inky appearance was observed in the west approaching with great rapidity. Just before reaching the city the atmosphere became filled with a yellowish haze resembling the setting sun. At 4.57 p. m. the storm struck this place, accompanied by heavy rain. It was of about three minutes duration, during which time the wind blew at the rate of seventy-two miles per hour and caused great damage in and about the city. After the passage of the storm the wind backed to south and it became very warm.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for February, 1883, with the telegraphic reports for the succeeding twenty four hours, shows the general average percentage of verifications to be 89.49 per cent. The percentages for the four elements are: Weather, 89.02; direction of the wind, 90.45; temperature, 89.04; barometer, 89.47 per cent. By geographical districts, they are: For New England, 80.11; middle Atlantic states, 88.86; south Atlantic states, 90.54; eastern Gulf, 89.77; western Gulf, 92.31; lower lakes, 89.26; upper

lakes, 90.43; Ohio valley and Tennessee, 91.34; upper Mississippi valley, 88.60; Missouri valley, 84.66; north Pacific, 80.95; middle Pacific, 92.31; south Pacific, 93.75.

There were eighty-six omissions to predict (thirteen being due to absence of reports from the Pacific coast) out of 3,444, or 2.50 per cent. Of the 3,358 predictions that have been made, eighty-two, or 2.40 per cent., are considered to have entirely failed; fifty-two, or 1.55 per cent., were one-fourth verified; two hundred and seventy-eight, or 8.28 per cent., were one-half verified; three hundred and seventy-two, or 11.08 per cent., were three-fourths verified; 2,574, or 76.66 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During February, 1883, ninety-two cautionary signals were displayed. Of these, seventy-five, or 81.5 per cent., were justified by winds of twenty-five miles per hour or more, at or within one hundred miles of the station. Seventy-two cautionary off-shore signals were displayed, fifty-seven of which, or 79.3 per cent., were fully justified; sixty-five, or 93 per cent., were justified as to velocity, and sixty-one, or 84 per cent., were justified as to direction. Twenty-nine cautionary signals were changed to off-shore signals. One hundred and sixty-four signals of all kinds were displayed, and one hundred and thirty-two, or 80.4 per cent., were fully justified. These do not include signals ordered at display stations, where the velocity of the wind is only estimated. Ten signals were ordered late.

One hundred and sixteen winds of twenty-five miles or over per hour were reported, for which signals were not ordered; many of these were high local winds or strong sea-breezes.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The highest and lowest stages of water observed at the Signal-Service stations, during the month of February, 1883, are shown in the following table:—

Heights of rivers above low-water mark, February, 1883.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.	
		Date.	Height.	Date.	Height.
<i>Red River:</i>	<i>ft. in.</i>		<i>ft. in.</i>		<i>ft. in.</i>
Shreveport, La.	29 9	28	21 2	11	15 9
<i>Arkansas:</i>					
Little Rock, Ark.		19	20 10	4	4 1
Fort Smith, Ark.		17	14 9	9	*—2 11
<i>Missouri:</i>					
Yankton, Dak.†	20 0				
Omaha, Neb.†	10 0				
Leavenworth, Kans.‡	21 0	26	8 9	28	6 5
<i>Mississippi:</i>					
Saint Paul, Minn.†	14 6				
La Crosse, Wis.†	18 0	25 to 28	3 4	19	2 10
Dubuque, Iowa†	21 10				
Davenport, Iowa†	15 0				
Keokuk, Iowa‡	14 6	19	16 4	18	15 9
Saint Louis, Mo.	30 0	26	26 3	13	5 4
Cairo, Ill.	40 0	26, 27	52 2	6	28 11
Memphis, Tenn.	34 0	28	35 7	1 to 5	22 11
Vicksburg, Miss.	41 0	28	42 2	1	24 7
New Orleans, La.†	—2 6	27, 28	—3 0	1	—9 1
Port Eads, La.		16	10 1	7 to 10	9 2
<i>Ohio:</i>					
Pittsburg, Pa.	20 0	8	27 6	3	5 6
Cincinnati, Ohio	50 0	15	66 4	3	26 10
Louisville, Ky.	24 0	16	44 5	3	11 2
<i>Cumberland:</i>					
Nashville, Tenn.	42 0	13, 14	41 5	4	14 5
<i>Tennessee:</i>					
Knoxville, Tenn.		7, 8	8 6	4	2 3
Chattanooga, Tenn.	31 0	10	17 7	5	7 6
<i>Monongahela:</i>					
Pittsburg, Pa.	29 0	8	27 6	3	5 6
Morgantown, W. Va.	28 0	8	24 4	24	4 6
<i>Savannah:</i>					
Augusta, Ga.		26	17 0	18	7 6
<i>Willamette:</i>					
Portland, Oreg.		2, 3	16 7	7	1 8
Umatilla, Oreg.†					
<i>Sacramento:</i>					
Red Bluff, Cal.		14	2 9	8	1 4
Sacramento, Cal.		15	11 8	11	9 4
<i>Mobile:</i>					
Mobile, Ala.		1	17 4	19, 21	14 5
<i>Colorado:</i>					
Yuma, Ariz.		22	16 8	1 to 4	15 0

* Below bench-mark. † Below high-water mark of 1874. ‡ Frozen the entire month. § Frozen part of month. See text.